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THE PRESENT STATUS OF VACCINATION AGAINST INFLUENZA

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EVER since the discovery in 1933 that a virus which is probably the cause of influenza could be isolated from patients, attempts have been made to fabricate a vaccine for protection against the disease. It is certainly possible to immunize animals. Mice, for instance, are highly susceptible to the virus, dying of a severe pneumonia in four to eight days following the instillation of living virus into their nostrils. If, however, they have been previously immunized by the subcutaneous or intraperitoneal injection of the virus (which so long as the dose is small does not cause infection by this route), they may resist many fatal doses of the virus given subsequently by intranasal inoculation.

Thus a group of ten mice was given a clarified suspension of virus, made by grinding infected mouse lungs in sand and saline, in doses of 0.2 cc. subcutaneously and 0.5 cc. intraperitoneally fourteen days later. After a further interval of fourteen days, the mice were given many fatal doses by intranasal injection. All the mice survived, nine with no lesions at all and the tenth with evidence of only slight infection. Of an equal number of control mice which received no previous immunization, eight were dead within a week. One of the survivors was severely infected and the other showed no signs of infection. Virus which had been previously rendered non-infective by the addition of 1: 1,000 formalin was found to be almost as useful an immunizing agent as living virus.

If it were possible to immunize the human population with the same ease as is apparently the case with a population of mice, the problem would be solved. There are, however, many difficulties. In the first place, there are at least two entirely separate and distinct strains of influenza virus, known as Influenza A and Influenza B. Not only do the viruses themselves differ in a number of important respects, but also, within limits, the types of infection

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they produce in human beings are different. And most important of all is the fact that there is no sharing of antigens, so that immunization with one does not confer a significant degree of immunity against the other.

In the second place, it is possible to demonstrate differences in the antigenic mosaic of the many strains of Influenza A which have been isolated since 1933. Provided adequate amounts of virus are present in the immunizing suspension, immunity to other strains of Influenza A may be readily obtained; but with smaller amounts, immunity to the homologous, and little or none to the heterologous, may be the result. A somewhat similar statement could be made in regard to different strains of Influenza B.

Thus, whatever strains may be used for the making of a vaccine, they must be as multivalent as possible, capable of immunizing against the majority of strains of Influenza A or B, and the dose administered must be large enough to give immunity not only to the homologous but also to as high a proportion of the heterologous strains as possible.

The vaccines used for the preceding experiments were made by grinding infected mouse lungs with sand and saline. The resulting mixture is hardly suitable for the large-scale immunization of whole populations and it is therefore necessary to obtain a better and possibly cleaner source of vaccine. For this purpose, it is possible to use the egg of the common barnyard fowl, the embryo of which, so long as it is inside the shell, is, by an as yet unsolved mystery of nature, highly susceptible to the virus.

At about the twelfth day of incubation, there is immediately within the shell a delicate membrane known as the chorio-allantoic membrane. Within this is the allantoic fluid, varying in amount from 5 to 10 cc. The embryo itself is surrounded by the amniotic fluid which is enclosed within the amniotic sac. The rest of the contents consists of the remains of the yolk sac and the albumin.

If a hole be made in the shell over the air sac, it is possible to insert a needle so that injections may be made into almost any part of the egg. The egg is then returned to the incubator for further development. Using this technique, it has been determined that influenza viruses attack the cells of the chorio-allantoic membrane, grow in them and cause necrosis. This process liberates virus into the allantoic fluid, the virus content being at its maximum after about 48 hours.

If the top of the egg over the sac be removed, it is not very difficult to aspirate the allantoic fluid aseptically. It is an almost clear suspension with a slight opalescence, giving a Tyndall effect, showing that it is colloidal. It is very rich in virus. Fluids infected with Influenza A, for instance, contain about 2×10^{-10} particles of virus per cc. The weight of this virus has even been determined, being about 0.05 to 0.07 mgm. per cc. of fluid or about 0.5 mgm. in the fluid of one egg.

It is possible to inactivate the virus by the addition of formalin without harming its antigenic powers and if 1-cc. doses of such inactivated allantoic fluid be injected into human beings, and the titre of the virus neutralizing antibodies in the serum be measured by the agglutination inhibition test after an interval of two or three weeks, it will usually be found that there has been

an increase in the titre. Thus, in one experiment, a group of twelve persons received one dose of 1 cc. of such a vaccine. The geometric mean of the titres of the sera taken before immunization was 37.5, but it became 244.0 two weeks later. Another group whose titre was 48.4 received two doses and its titre increased to 265.6. It must be stressed, however, that some persons responded either not at all or very poorly. This may have been partly due to the fact that an insufficient quantity of virus was given. For this reason, attention was then paid to possible methods of concentration so that more virus particles could be administered in convenient quantities of suspending fluid. The methods now available for this will be described presently. One-cc. doses of such concentrated suspension were given to two groups of individuals, one group receiving one dose and the other two doses. As judged by titrations, this vaccine contained approximately twenty times as many particles as the fluid used in the experiment quoted above. The response was both more regular and more marked. Indeed, the geometric mean of the titres after one dose was 585.95 and after two doses 489.80, which is almost double that obtained with unconcentrated material. It was even higher than the level obtained after actual infection, which in a group of 27 persons was only 195.00.

These preliminary studies suggest that with one dose of concentrated virus vaccine it should be possible to raise very considerably the immunity of a population as judged by the virus neutralization tests with the serum. This is to some extent confirmed by a series of immunizations using concentrated vaccine carried out about three years ago in various centres across Canada. Fifty-seven persons received vaccine and 30 received saline as a control. Two months later, the geometric mean of the immunized group was 204.85 and of the controls 21.43.

All this shows very clearly that it is possible to alter the antibody level of a population very considerably. Whether it is thereby better protected than another group not so treated is another matter: but it would certainly seem that the vaccine should contain many more virus particles than are normally present in untreated allantoic fluid.

Removal of water and salts, leaving the virus suspended in smaller volumes of fluid, sounds a formidable undertaking. Influenza A, for instance, consists of spherical particles having an average diameter of 70 micro mu; Influenza B is slightly larger, being about 100 micro mu. Being of this order of magnitude, the particles are unaffected by the field of force exerted in the ordinary centrifuge which revolves at about three or four thousand revolutions per minute. It is possible to throw it down at speeds of twelve to thirteen thousand in the air-driven centrifuge, but only small quantities can be handled, and, in any event, the centrifuge must run for an hour. Even a speed of 27,000 takes about 45 minutes to get it down and the quantities which can be handled are correspondingly less. By suitable modification, however, of the Sharples supercentrifuge, which works on the principle of the milk separator and whose bowl revolves at about 40,000 revolutions per minute, giving a field of force of about 45,000 g. over a layer two millimetres thick, it is possible to get most of the virus out of a litre of fluid in about an hour. Contamination of the precipitated virus with microbes picked up in the fluid during

harvesting, or in the air currents which pass through the centrifuge while running, may be a very serious source of loss. In any event, considerable amounts of machinery would be required if any quantity of fluid were to be handled.

There are, however, a number of other methods which may be employed. One of these was worked out in the Connaught Laboratories about three years ago. This method takes advantage of the fact that allantoic fluid is apparently a widely dispersed lyophilic or emulsoid colloidal protein in a continuous phase of water and salts, particularly urates which are of low solubility and approaching saturation. If the fluid be supercooled, a precipitate settles out, consisting mostly of urates together with masses of denatured protein. The coagulation of this protein provides an enormous surface relative to its total mass for the adsorption of the monodisperse virus particles so that these too are present in the precipitate. It is rather difficult to supercool a liquid in any quantity but fortunately the same result is obtained if the fluid be frozen solid and allowed to melt slowly without disturbance. The same precipitate forms and contains most of the virus. The precipitate can be separated from the rest of the fluid by centrifugation at 2000 revolutions per minute in an ordinary centrifuge and if it is treated with slightly acid buffer, the virus can be eluted into a volume of fluid only one-tenth as great as that from which it was derived. We have made considerable amounts of vaccine in this way, with an overall efficiency of about 60 per cent.

A third method takes advantage of the fact that the lipoid envelopes of the red cells of the chicken have a high adsorptive affinity for both Influenza A and B viruses. In common with most other adsorption phenomena, adsorption tends to take place at low temperatures and elution at high. Fortunately the range in temperature is not very great, maximum adsorption taking place at about zero and maximum elution at 37°C.

Therefore, when the allantoic fluid is being withdrawn from the eggs, all that is necessary is to rupture a few blood vessels in the chorio-allantois to allow blood to escape into the allantoic fluid. The mixture of fluid and red cells is then aspirated into a bottle held in ice. Adsorption takes place almost at once and, in addition, the red cells become agglutinated, falling to the bottom in a mass. The supernatant fluid contains very little virus. This is withdrawn and thrown away. One-tenth of the original volume of saline is then added, and the temperature raised to 37°C. and maintained there for two hours. Most of the virus leaves the cells and is once again in suspension. This is removed and after inactivation with formalin constitutes the vaccine. In this way, it is possible to recover 70 to 80 per cent of the virus present in the fluid, in a volume only one tenth as great.

There is no doubt that vaccines made by any of these methods are strongly antigenic. Thus a vaccine made by the red-cell method described, and containing equal amounts of Influenza A and B viruses, will on dilution to 1:50 protect the majority of mice against relatively enormous doses of living virus instilled intranasally.

The obvious question must therefore be faced whether these vaccines which act so well in a mouse population are of any value for the immunization

of human beings. Perhaps the most critical method of all is to apply the methods of animal experimentation to human beings and immunize a population and then infect it artificially. Fortunately influenza is a sufficiently mild disease to permit this and two experiments of this sort have actually been carried out at Ypsilanti by Dr. Francis and his associates (Francis *et al*, 1944) (Salk *et al*, 1944). In both, the population was immunized with a concentrated vaccine made by red-cell adsorption and elution and containing equal amounts of Influenza A and B. At varying times after immunization, the subjects were infected by the intranasal instillation of Influenza A or B. A number of control subjects who had not received the vaccine were similarly infected. Of the 36 controls infected with Influenza A, fifty per cent had temperatures over 100°F., whereas of 66 immunized persons, only 15 (twenty-two per cent) had this degree of fever. Somewhat similar results were obtained with Influenza B infection. Forty-one per cent of 27 controls had temperatures of 100°F. and over, whereas of 69 immunized, only 7 (ten per cent) were infected to the same extent.

A similar vaccine was also used for very extensive immunization procedures two years ago in the United States at centres across the country, being given in 1-cc. doses to 6,263 persons while 6,211 were given saline as controls. It would be difficult to imagine better conditions for the experiment than were provided in this case, for in most of the centres, the immunizations were completed only a month or two before the epidemic came. There was considerable reduction in the incidence of cases in the immunized group, only 2.22 per cent having clinical influenza, whereas 7.11 per cent in the control group became infected. Dr. Francis and his associates did not carry out any statistical analysis of these figures but the standard error of the difference between the attack rates is 0.375 per cent. Since the actual difference in the attack rates of the control and test groups is 13.0 times its standard error, it is obvious that the probability of this difference having arisen by chance is remote. Nevertheless, there were 138 cases in the immunized group, and the question arises whether or not these could have been prevented.

The first thing that comes to mind is that the vaccine was not strong enough. This may well be the case, for Salk, Menke, and Francis (1945) obtained post-vaccination titres of 308 for the PR8 strain in eighty-two persons, and Hirst, Plummer, and Friedewald (1945) titres of 695 for PR8 in two hundred and fifty-five persons receiving this vaccine, whereas a presumably stronger vaccine made by the freezing method was found by Hirst, Rickard, and Friedewald (1944) to give post-vaccination titres as high as 1209.

It is improbable that a second dose would produce any higher level of immunity, for unlike the majority of immunization procedures, the vaccine produces a secondary rather than a primary response, most of the adult population having had previous experience with Influenza A or B. This is to some extent confirmed by the very rapid rise in antibody level which follows one dose, as well as the observation that the antibody level reached after one dose is as high as that after two (Hare *et al* 1943).

Assuming that vaccination against influenza is a valuable proceeding, a very important corollary is the duration of the protection produced in this

way. There is, unfortunately, much evidence that it does not last very long and that the immunity falls off comparatively soon after the injection. For this reason, investigations have been made to see whether by admixture of the virus with some substance which will hinder absorption, the resultant immunity will last longer. Several systems are available for this, such as admixture of the virus with a mineral oil or incorporation of the virus in a precipitate such as calcium phosphate or aluminum hydroxide. Very little has been published on this phase of the question, but it would seem to be probable that a higher or more prolonged response occurs than after the administration of virus suspended in simple saline.

On the whole, there can be little doubt that if vaccination against influenza is going to be a success, quite large doses of virus will be required. But in order to provide this amount of virus, it is necessary to use the whole of the infected allantoic fluid from two or possibly three eggs. For this reason, almost astronomical numbers of eggs will be required if most of the population is to be immunized. The cost, too, cannot be small, seeing that one egg incubated to the twelfth day costs about twelve cents.

The very obvious question must therefore be answered, whether by present methods we are persuading the egg to give its maximum yield of virus. As a result of certain improvements in technique, we are certainly getting much more virus in the allantoic fluid than we did only three years ago. Our titres now are two to four times what they were. As a result of researches carried out in various laboratories we also know almost to within half an hour the exact time to incubate the eggs, and the exact temperature not only for the development of virus but also from the moment the egg is laid. We also know the correct humidity and the best method for seeding.

Nevertheless, it may be argued that because we only harvest the allantoic fluid, we may be throwing away considerable quantities of virus in the rest of the egg. This, too, has had considerable attention in various laboratories; and except for relatively small amounts in the chorio-allantoic membrane, whose processing poses very big problems, the remaining structures in the egg are remarkably free of the egg-adapted virus used for this type of work.

Lastly, the question may well be raised whether the egg-adapted strains we are using for vaccine manufacture are the right ones, whether they possess the requisite amounts of whatever corresponds to the V antigen of *B. typhosus*, for instance. This question must be left unanswered, for, other than Burnet's work on this subject, little has been done.

On the whole, much progress has been made recently, but the problem is by no means solved. It would seem that immunization of a human population might be a valuable proceeding, but that concentrated suspensions of virus will be necessary; that an adjuvant is probably advisable; that enormous quantities of eggs will have to be processed; that the cost will not be small; and, most important of all, that the vaccine will have to be made before an epidemic, as the necessary tests require about a month and dealers in eggs cannot, without due warning, suddenly supply large quantities of fertile eggs. Nevertheless, the technical procedures have now reached a sufficient degree of precision, and we have some idea how to test the vaccine and of the necessary

potency tests it should pass. Whether such vaccines are of value must, however, await further experimentation.

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Hotel Accommodation for the Annual Meeting

THE Association regrets that only a limited number of rooms are available at the Royal York Hotel for this year's annual meeting, May 6-8. Requests for reservations at this hotel should *not* be addressed to the Royal York, but to the Canadian Public Health Association, 150 College Street, Toronto 5. Only double rooms are available For the convenience of members in requesting reservations, a form is provided on page 43 of this issue.

Reservations for hotels other than the Royal York should be forwarded direct to the hotel concerned.

SEEING IS BELIEVING IN SANITARY CONTROL*

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MOST health and food-control officials would agree that the man charged with the task of sanitizing equipment in food and beverage establishments performs a highly important and difficult job. He deals with the removal of biological dirt which affects the flavour of foods and, in some cases, may spread disease among the patrons. His undertaking is complicated by the fact that a simple scientific method of measuring the success of his efforts to provide clean dishes has not been made available to him.

Some workers in commercial enterprises have seen samples taken for analysis in a bacteriological laboratory and later have read the report of the analyst. To only a few has this form of qualifying the efficiency of sanitation much meaning. Others look upon it as providing little of significance. The usual plating method, used in sanitary control, has limited educational value and fails to inspire workers and management to attack the problem seriously.

Consequently the main problem in sanitation seems to centre round the point well portrayed by the dictum, "Out of sight, out of mind." It has been accentuated during the war periods through factors concerned in priorities of labour, supplies and equipment. It will not be relieved by old or new methods in the immediate future unless the persons directly concerned understand the need for them. They must be assisted in becoming "microbe-conscious." Educational courses, literature and movies have a place in this undertaking; but too often they are accepted as having application to other plants under other conditions. They fail to arouse the individual to definite action in his own plant. It may not be feasible to have bacteriological laboratories in each establishment. However, it is possible to take travelling laboratories to them, and there, before the personnel of each establishment, to carry out simple tests on equipment that even the least trained workers will understand. They may see for themselves how well they are doing their jobs and be inspired to avail themselves of more modern methods of sanitizing.

A procedure for the "seeing is believing" approach to sanitary control, developed from the previous studies in this laboratory (1), was carried out in several commercial establishments in Manitoba during the summer of 1945. It is suggested as a simple and practical method for bringing restaurant and beverage-room personnel to a realization of the need for better sanitation and of the improvement that will result from a little extra thought and effort.

The Travelling Laboratory—Equipment and Supplies

Simplicity is the key to success in any method designed to convince non-technical personnel. Equipment must permit ease of transport. The actual

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procedure must appear reasonable. The results must be observable by the people concerned. The gradings and records must be concise and self-explanatory. Only the preparation of the supplies for the test involves the bacteriological laboratory.

The oval test-tubes for the medium previously proposed (1) proved inadequate for this purpose, since evaporation caused too rapid drying of the medium. A thin, flat screw-capped one-ounce bottle* sold under the trade name "Prince of Wales" proved to be much superior. It is relatively cheap and very durable. On sanding one edge of the bottle, a surface was provided for easy labelling with an ordinary lead pencil. Each bottle required only 4.5 mls. of medium to produce an effective slant surface. The medium that proved the most generally all-purpose or literally "shot-gun" type for even some fastidious bacteria as well as for yeasts and moulds, was basically the tryptone-glucose-extract-milk (T.G.E.M.) agar used for dairy products. To this was added 0.4 per cent Difco yeast extract, 1 per cent milk and 1 per cent agar. The heavy agar content provided a strong gel, permitting considerable pressure during swabbing. After sterilization at 15 pounds steam pressure for 30 minutes, the medium was slanted by laying the bottle flat on the side closest to the sanded bevelled edge. At first, considerable loss of these slants resulted due to the contamination apparently drawn into the tightly capped bottles while cooling. This was finally overcome by laying the bottles, hot from the autoclave, on towels soaked in a disinfectant solution, then tightly wrapping these towels about the bottles. Towels soaked in 10 per cent high molecular alkyl-dimethyl-benzyl-ammonium chlorides (Roccal) at a concentration of 1 ounce to 3 gallons of water proved superior to dry sterile towels, probably due to the impregnation of the fabric by this cationic germicide. After solidification the slants need considerable conditioning to dry the medium surface. The dry surface grips the swab and serves to extract more material from it. Also, it reduces the tendency to develop spreader colonies. In a 37°C. incubator, with the caps loosened, this was accomplished effectively in three or four days. After tight sealing of the caps, these slants may be stored almost indefinitely.

Commercially prepared Glasco cotton-tipped applicators, cut to a 4-inch length, packaged, folded and sterilized in glassine coin envelopes $4\frac{1}{2} \times 3$ inches, proved excellent for this test. Sterile water for moistening swabs was provided in a single bottle, similar to those for the medium, for each establishment visited. A special tray for holding these bottles securely, while at work, was an advantage.

For transport and ready use of the equipment, supplies and accessories, convenient travelling cases were designed. One, loaded to capacity, proved a neat housing of the materials for the examination of twelve surfaces in each of nine establishments. This travelling laboratory, set on a table or counter, with one side opened down, was ideal for carrying out the test without disturbing the routine of the establishment. One of these is shown in Figure 1.

**The substitution of ½-oz. bottles and wooden blocks, bored to hold inverted bottles by their caps, would provide a more compact unit for displaying cultures. The smaller bottles furnish two-thirds the culture surface with less than half the medium and total weight. The block type of rack has less bulk and is more solid.*

The only equipment other than that in the travelling laboratory was the culture display rack,* one of which was to be left in each establishment. It was designed to hold 15 bottles in a manner facilitating proper culture developments and easy observation at all times. This set-up is shown in Figure 2. In several instances this means of publicising good sanitation to clientele proved so stimulating to business that neighboring establishments were "put on the spot" to emulate the example.

Procedures for Sanitary Examinations

In eating and drinking-places, parts of equipment that come into contact with the mouth should be tested, while in dairies and other food industries the equipment coming in contact with the product after processing should be examined.

Carefully withdraw a swab from the glassine package, moisten it in sterile water and squeeze against the bottle neck before application to the surface to be tested. The method of swabbing should be uniform for similar surfaces and in general conform with the stipulations prescribed by the United States Public Health Service (2). Contact the side of the swab rather than the tip and rotate over the surface being tested. Immediately smear and rotate the contaminated swab over the surface of the medium from top to bottom and back to the top. Label bottles and post complete records. Place the bottles, caps down, in the display rack, which is so constructed that they tilt backward slightly from the medium surface. This position is important to permit excess moisture to drain away from the medium and thus prevent the formation of spreader colonies.

The most logical place for incubation appears to be close to the sanitized equipment where the results will be in constant view of the staff. At average room temperature, colony development reaches a static state within three days. This means that readings may be made at any time after this period to fit into any schedule of visits by the official.

Generally results are so convincing that improvements in sanitizing methods have been put into effect before the returns of the official. For the purpose of record, the following simple arbitrary gradings were used: Good, 0 to 10 colonies; fair, 11 to 50 colonies; poor, over 50 colonies. These grades may be differentiated easily and by even the least trained eyes. The sanitary state of each source tested need only be ticked in the proper column in the record book. A duplicate copy left with the management serves as a permanent record that adds to the educational value of the undertaking.

Proof of the Method

With the endorsation and co-operation of public health officials, the method was tested last summer in 32 eating establishments and 11 beverage rooms in Winnipeg. These provided a representative cross-section from good to poor types of the trade. Examinations were made at each establishment at intervals of 5 to 8 days over a period of 10 weeks, from late May into August. In eating

*See footnote on page 91.

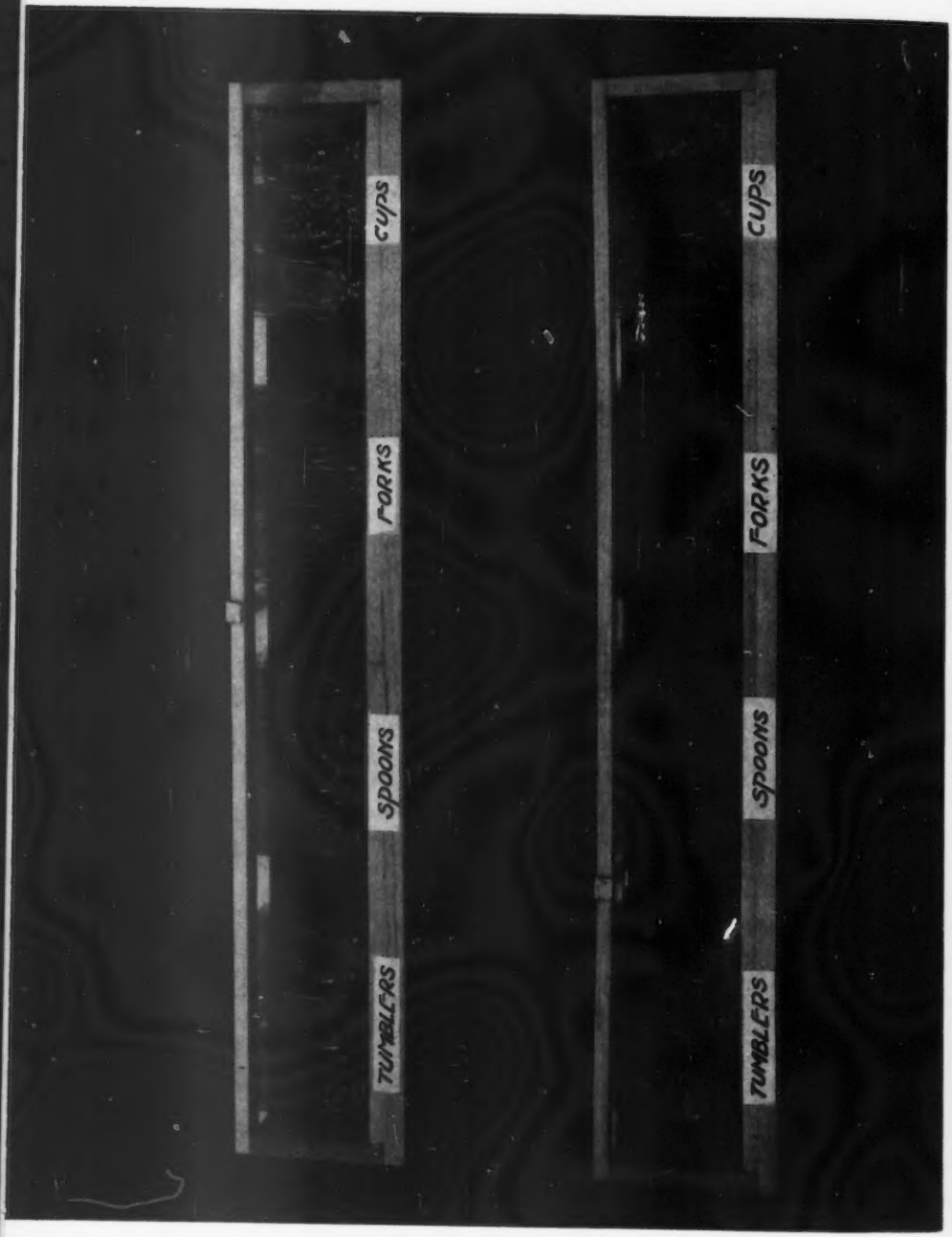

FIGURE 2 Display racks showing results of poor and good sanitation. In this case the use of a disinfectant made the difference.

establishments 3 cups, 3 forks, 3 spoons, 3 tumblers and frequently 3 cream tanks or pitchers, all when ready for serving, were tested. The latter, though not concerned in mouth contact, generally furnished excellent examples of the need for improved sanitation. In beverage rooms the tests involved 10 glasses ready for filling and 1 used glass to demonstrate the need for sanitizing.

At the end of June, after 5 replicates of the test had been completed, the management of each establishment was provided with a summarized report of results from all co-operating establishments, using code numbers only rather than names of the concerns. This was done again at the conclusion of the survey. It added greatly to the educational value of the project, stimulating interest and creating confidence. The personnel of some establishments that looked upon the results of their efforts as reasonably satisfactory learned that other concerns had better showings and were moved from their complacency. The workers in other establishments who viewed the undertaking with skepticism and were prone to accept the situation as hopeless caught the idea that improvement was possible and began to enqire about better methods and to show more interest in sanitation. Obviously, there was room for improvement in every establishment. In some cases sanitation generally was poor. In others a fair job was being done on cups, but forks or cream tanks left much to be desired from the standpoint of sanitation. Obviously too, spectacular improvement in such a difficult task could not be expected. However, the overall average results for the month of July indicate a trend when compared to those for the month of June. This is brought out in the data presented in the table. Only the machine-washed tumblers and cream tanks failed to indicate improved sanitizing efficiency. The improvement that resulted in the beverage-room glasses was outstanding.

EATING UTENSIL AND BEVERAGE GLASS SANITIZING EFFICIENCY, EXPRESSED AS PERCENTAGE OF TESTS IN EACH GRADE.

EATING ESTABLISHMENTS— MACHINED WASHED

Month	Cups			Forks			Spoons			Tumblers			Cream Tanks		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
June Average	12.6	49.7	37.7	10.8	53.2	36.0	13.1	50.9	36.0	33.8	40.0	26.2	23.1	42.3	34.6
July Average	31.6	40.9	27.5	42.7	38.0	19.3	36.8	45.6	17.6	33.9	35.7	30.4	30.5	29.3	40.2
							EATING ESTABLISHMENTS—HAND WASHED								
June Average	10.8	48.7	40.7	14.4	36.9	48.7	17.5	43.3	39.2	18.6	40.7	40.7	–	14.3	85.7
July Average	23.8	42.4	33.8	39.4	35.9	24.7	38.9	37.4	23.7	35.9	33.3	30.8	21.3	27.7	51.0

BEVERAGE ROOMS—HAND WASHED

Month	Glasses		
	Good	Fair	Poor
June Average	30.8	9.3	59.9
July Average	63.2	13.4	23.4

Discussion

To be effective, sanitary inspection must stress education first and control second. The results of this study indicate clearly that education is necessary and that it may be expected to produce results. They show further that education in sanitation depends upon demonstration, which is closely associated with simplicity of procedure. The method outlined above has merit from this standpoint. Any worker with average intelligence can follow what is being done and can see for himself the type of results his efforts produce. And in most cases he will strive for improvement. The second step in education comes when the worker has caught the idea that he can improve—when he has been convinced that things are not as good as they should be. He becomes more interested in methods and materials and wants to be informed of better procedures. He is even anxious to try things for himself when he knows he has a good yard-stick by which to judge the success of his efforts.

Of course this method is elementary. But it need not remain elementary long. Probably standards should be more exacting; and probably the medium should be selective in relation to species of bacteria known to be dangerous. These are problems that can be faced once the trade has become microbe-conscious—has caught a vision of its responsibility to provide its patrons with safe as well as clean eating and drinking utensils.

Summary

A simple procedure for assisting eating and drinking-establishment personnel in sanitation problems is outlined. It involves a suit-case type of laboratory that commands interest and inspires enthusiasm and effort. It is based on the swab-streak principle. The procedure from swabbing of the surfaces to the examination of the results is carried out in the establishment. Sufficient detail is presented to enable anyone with access to a bacteriological laboratory for the preparation of supplies, to apply the method in any educational or control program.

The method was used in a preliminary survey of sanitary conditions in several representative restaurant and beverage places in Winnipeg, during the summer of 1945. The results of this survey are included in this report.

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A STUDY OF NUTRITIONAL CONDITIONS IN A GROUP OF URBAN CHILDREN

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and Board of Health, Hamilton

AN examination of children attending public schools in Hamilton, conducted by the School Medical Service in the winter of 1944-45, indicated an unexpected amount of malnutrition. A more detailed survey was planned in an attempt to determine the reasons for the incidence of malnutrition. It was decided to investigate in detail conditions in two schools (A and B) in which the initial survey had shown a more-than-average incidence. About 200 children in the schools were studied, about 100 being from those classed as underweight by the School Medical Service and the remainder being average or overweight. The detailed study was made by a nutrition survey team from the School of Hygiene and comprised the following:—

1. A physical examination of each child, with particular attention given to abnormalities of the skin and tongue, to muscle tone, and to other points considered of special nutritional significance. Note was made of any defects of heart, lungs, teeth, tonsils or thyroid. At the time of the examination, the examiners recorded the child's general health and nutritional status as excellent, good, fair or poor.
2. Samples of capillary blood for haemoglobin estimations were taken.
3. Each child was interrogated:
   (a) to obtain a medical history, with special regard being given to symptoms of nutritional deficiencies;
   (b) to obtain a history of usual food habits.
4. The children ten years of age and older were asked to keep a record of all their food intake during a seven-day period. The method of keeping such a record was explained to them in advance, and their teachers cooperated in supervising the recording of the diets. In many cases, the children's mothers kept the diet record for them. One hundred and eighteen completed seven-day records were obtained.

Observations

The students examined fell into the following groups:

		School A			*School B*			
Underweight	girls	32	44	girls	41	62	106	
	boys	12		boys	21			
Normal or Overweight	girls	27	39	girls	36	55	94	
	boys	12		boys	19			
						Total	200	

The nutritional status of the subjects, by physical examination, was found to be as follows:

			Excellent	*Good*	*Fair*	*Poor*	*Total*
Underweight	School A	girls	0	7	16	9	32
		boys	0	1	7	4	12
	School B	girls	1	9	20	11	41
		boys	0	0	14	7	21
			1	17	57	31	106
Normal or Overweight	School A	girls	1	19	7	0	27
		boys	1	9	2	0	12
	School B	girls	11	18	6	1	36
		boys	2	14	2	1	19
			15	60	17	2	94

The children graded as excellent or good were considered to be in a satisfactory state as regards nutrition; those graded fair or poor were definitely unsatisfactory.

The School Medical Service had previously reported that about 10 per cent of the children in the public schools were undernourished. The "underweight" group examined by us came from those previously classed as undernourished. This survey supports the previous report in that 83 per cent of the "underweight" group were found to be of unsatisfactory nutritional status.

Occurrence of Nutritional Defects

The most common defect found was marked underweight. Obesity was much less common, and no cases of really marked obesity were seen. It is recognized that many healthy individuals are constitutionally thin, so that underweight alone, in the absence of signs of ill-health, was not considered sufficient reason for grading the nutritional status as unsatisfactory. However, a great number of the underweight children showed poor muscular development; bad posture; weary, lack-lustre, facial expressions; and a general air of fatigue. Such individuals were graded as having a fair or poor nutritional status.

Dental conditions in the examined children were unsatisfactory, as has been found in other surveys in Ontario. Thirty per cent of the children were graded as fair or poor with regard to dental caries. This is similar to conditions found in a group of rural children examined in 1944, of whom twenty-six per cent were graded as fair or poor by the same standards. All caries, treated and untreated, were counted, since our interest was in the total amount of caries.

Twenty-six of the children (13 per cent) had some degree of thyroid enlargement; this was marked in only four subjects (2 per cent). Most of the thyroid enlargement seen was in girls of eleven or older, of whom 26 per cent

showed some degree of thyroid enlargement. The distribution was about the same in the different grades of nutritional status. No clinically recognizable hyperthyroidism was seen and, except in the four cases noted, the enlargement could not be definitely classed as pathological.

It has been suggested that ascorbic acid deficiency causes gingivitis. The condition of the gums was examined macroscopically in a good light and the subjects were questioned as to the occurrence of sore or bleeding gums. Seventy-nine (40 per cent) had some evidence of gingivitis (in many cases only a reported occurrence of bleeding when the teeth were brushed); definite gingivitis was seen in only two subjects.

Cracking, reddening and fine scaling at the corners of the mouth, combined with reddening of the contiguous portions of the lips, constitute the syndrome known as cheilosis, sometimes attributed to riboflavin deficiency. These changes were seen in some degree in twenty-one subjects (11 per cent); they were well-marked in five cases.

Hyperkeratosis, or thickening and roughening of the skin, with "goose-pimple" elevations around the hair-follicles, has been claimed to indicate vitamin A deficiency, although there is considerable doubt on this point. Seventy-seven children (39 per cent) showed some hyperkeratosis, which was marked in eighteen subjects (9 per cent).

Some investigators have described changes in the tongue, such as swelling, fissuring, reddening, atrophy of the filiform papillae and hypertrophy of the fungiform papillae, which they ascribe to deficiencies of niacin and/or riboflavin. One or more of these changes were seen in thirty-nine subjects (20 per cent) but the changes were marked in only one subject.

Any of these changes (gingivitis, glossitis, cheilosis and hyperkeratosis) occurred nearly as often in well-nourished as in ill-nourished subjects.

Haemoglobin determinations were made by an accurate laboratory procedure involving the use of a photoelectric colorimeter; 15.6 grams of Hbn./100 cc. were accepted as 100 per cent. On this basis, values were surprisingly low. Sixteen children had haemoglobin levels of 90 per cent or over, one hundred had haemoglobins between 80 and 89 per cent, seventy-seven had haemoglobins between 70 and 79 per cent, and seven had haemoglobins below 70 per cent.

Dietary Habits

Completed diet histories of the usual food habits were obtained from two hundred children, and seven-day records of food intake from one hundred and eighteen of that number. The records of food intake were then calculated in terms of the various nutrients, both in absolute values and in terms of their adequacy by comparison with the allowances recommended at the time by the Canadian Council on Nutrition. All values were expressed as percentages of these recommended daily allowances, and classified as follows:—excellent, 90 per cent or more of the standard; good, 80-89 per cent; fair, 70-79 per cent; poor, below 70 per cent. The composite value of food consumption, herein called the diet score, was determined by averaging the percentage adequacy of calories, protein, calcium, iron, vitamin A, thiamin, riboflavin and ascorbic

acid. In this calculation any individual value over 100 per cent was taken as 100 to prevent undue weighting by an excess of any one constituent.

The following data on food consumption were thus derived:—

Grading of Nutritive Value of Food Consumption

(The figures given are percentages of the total number of children)

	Excellent	*Good*	*Fair*	*Poor*
Calories	25	18.5	18.5	38
Protein	73	11	9	7
Calcium	51	10.0	11.0	28
Iron	59	13.5	13.5	14
Vitamin A	76	9	10	5
Thiamin	21	17	19	43
Riboflavin	67	9	8	16
Ascorbic acid	38	8	15	39
Diet score	37	26	18	19

The grading of supplies of nutrients in terms of recommended allowances has been criticized frequently and it should be recognized that some, at least, of the allowances are generous. In the present study no correlation was found between the above grading of nutrient supplies and the physical condition of the children. However, a study of the above table suggests that deficiencies of calories, calcium, thiamin, and ascorbic acid might be suspected.

The consumption of the more common and highly nutritive foods was studied. Using the following system of grading, a table was made summarizing the food habits of the group.

Procedure Used in Grading Food Supplies

	Excellent	*Good*	*Fair*	*Poor*
Milk, cups daily	3	2	1	< 1
Cereal or bread, servings daily	6	4	2	< 2
Citrus fruit, servings weekly	7	5	2	< 2
Vegetables, servings weekly	14	10	5	< 5
Meat, fish or fowl servings weekly	7	5	2	< 2
Eggs, number weekly	5	2	1	< 1

To evaluate the meals customarily eaten by the children, the following basic meal patterns were used:

A. Breakfast

Excellent
fruit or juice
milk
2 of { cereal / toast / egg or bacon }

Good
fruit or juice
milk
1 of { cereal / toast / egg or bacon }

Fair
2 of { fruit / milk / egg or bacon / cereal / or toast }
or missing
3 or less per week

Poor
1 of { fruit / milk / egg / bacon / cereal / or toast }
or missing
> 3 per week

B. *Lunch*

Lunch was graded as excellent if it supplied five of the following items, good if four were used, fair if three were taken (or if lunches eaten were satisfactory but up to three lunches per week were not eaten), poor if only two of

the following items were generally used (or if more than three lunches were missed in a week).

Basic lunch pattern: 1. Soup, sandwich, or meat.
2. Vegetable, cooked, raw or juice.
3. Bread.
4. Milk.
5. Dessert.

Percentage of Group with Specified Grading of Food Habits

	Excellent	*Good*	*Fair*	*Poor*
Milk	57	24	12	7
Citrus fruit	33	12	33	22
Cereal, bread	33	42	19	6
Vegetables	14	16	50	20
Meat	74	11	12	3
Eggs	32	47	14	7
Breakfast	14	13	63	10
Lunch	10	37	43	10

An examination of the data regarding milk consumption indicates that the intake is, as a rule, fairly good, and that the 57 per cent who are classed as excellent in milk consumption, in most cases drink quantities well in excess of needs. The Canadian Council on Nutrition recommends one pint a day for children, and in this group 19 per cent are receiving less than this amount.

The consumption of citrus fruit was decidedly small and obviously the cause of the low intake of ascorbic acid found in a large proportion of the group. It is worthwhile to point out that the consumption seems to be rather spasmodic in this respect, for many children said that they ate oranges in large number "whenever mother buys them", or "as long as they last". Twenty-two per cent of the children had citrus fruit less than twice a week and some, not at all. The low consumption of citrus fruit was not compensated for by a liberal use of Canadian sources of ascorbic acid, such as tomatoes, tomato juice, cabbage salad, etc. In the case of bread and cereal, the intake seemed fairly adequate in amount, although few used a whole grain rather than a highly refined variety. Of the two hundred studied, only nine consumed at least half of their bread as a whole-wheat product, so that the contribution of thiamin and of riboflavin by bread was small in the diet of this group.

The consumption of vegetables was found to be surprisingly small, 70 per cent of the group receiving only fair or poor supplies. This situation is probably due in large measure to familial food dislikes, which are often difficult to overcome, and to a lack of nutritional knowledge in the home.

The meat and egg consumption was fair, and liver was eaten frequently by many of the children.

An examination of the usual breakfast and lunch of each pupil shows that there was a highly significant correlation between the two. That is, those who had good breakfasts almost invariably had good lunches and those who had poor breakfasts did not compensate for their lack by eating a good noon meal.

The following are common examples of the customary lunches reported:—

1. Vegetable soup, white bread, coffee or milk.
2. Fish and chips, piece of cake.
3. Weiners and potatoes, white bread, milk.

The general impression secured in the survey was that the type of breakfast supplied to most of the children was unsatisfactory and that many of the children were obtaining only one substantial meal per day.

The consumption of soft drinks, candy and pastry by the children was very considerable. The purchase of non-essential foods was so large that it can hardly be assumed that the use of good foods was limited by financial reasons.

The data gathered in the survey give the impression that the principal factor contributing to the occurrence of poor nutrition among the children examined was a lack of information regarding nutrition and a failure on the part of some householders to manage their children and to take advantage of the nutritional information supplied.

Summary

1. Two groups of children were examined for evidence of malnutrition. In the underweight group 83 per cent were considered to be in unsatisfactory condition; in the normal and overweight group 20 per cent were so classified.

2. The most common defect was that of definite underweight with poor muscle tone and other evidences of sub-optimal health.

3. Considerable incidence of dental caries was evident in both normal and underweight groups.

4. Haemoglobin levels were lower than is generally considered to be satisfactory.

5. Mild thyroid enlargement was seen in about one-fourth of the adolescent girls but probably was not pathological except in four cases.

6. The general picture of food habits was unsatisfactory in both quality and quantity. The use of milk, meat and eggs was reasonably good but the consumption of fruit, vegetables, and cereals of high nutritive value was poor. Most of the children were receiving inadequate breakfasts and noon meals. The consumption of soft drinks, pastry and candy was high.

7. The cause of the existence of malnutrition did not appear to be primarily economic in view of the amount spent for non-essential foods.

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PHENOTHIAZINE IN THE TREATMENT OF ENTEROBIASIS (II)

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A PREVIOUS report on the use of phenothiazine in the treatment of enterobiasis was published in 1941 (1). While the observations recorded in that report were being made, Manson-Bahr (2) published the first report on the use of phenothiazine in the treatment of parasitic infections in human beings. He found that phenothiazine had no effect on *Ascaris lumbricoides* and *Ancylostoma duodenale,* but that the drug was effective against *Enterobius vermicularis*; nine patients treated were cured and no untoward reactions were encountered. In recent years gentian violet has been the drug of choice (3, 4) for the treatment of enterobiasis, but according to the published reports approximately 40 per cent of the treated subjects have shown a gastro-intestinal upset of varying degree; no severe reactions or fatalities, however, have resulted from its use.

The present report deals with observations on further trials carried out to determine the minimum effective dosage that could be used with safety, especially in small children.

PROCEDURE AND RESULTS

Subjects Investigated. Individuals from the following sources received treatment; patients on the medical wards and out-patients of the Hospital for Sick Children, Toronto; the Thistletown Branch of that hospital and the I.O. D.E. Convalescent Hospital; Women's College Hospital and the Toronto General Hospital; children in foster homes supervised by the Infants' Home and the Children's Aid Society, Toronto; private patients of a number of physicians in Toronto and elsewhere in Ontario. The last group was composed mainly of 102 families in which one or, in some instances, every member was infected.

The ages of the individuals treated ranged from 3 months to 78 years. Eleven children were under 1 year of age and eight adults were 60 years of age or over. The majority of the adults were examined because their children were infected. The others were single adults or families of adults who had symptoms suggestive of pinworm infection or where the parasite had been seen.

The patients up to 15 years of age inclusive are arbitrarily grouped as children, and over 15 years of age as adults.

Method. Diagnosis was made by the demonstration of pinworm ova on perianal swabs, using the NIH swab technique (5, 6). Swabs were taken on five consecutive mornings. If the infection was demonstrated and treatment given, seven swabs were similarly taken during the second week after the completion of treatment. The criterion of the effectiveness of the treatment was that 7 post-

treatment swabs should show no ova. In those cases where the first course of treatment was not effective, treatment was repeated 4 weeks later.

Swabs for diagnosis were taken from 2,505 individuals—1,380 children and 1,125 adults. Phenothiazine was administered to 1,275 patients (900 children and 375 adults). Post-treatment swabs were obtained from 790 patients (584 children and 206 adults). The results showing the effectiveness of the treatment are based on these 790 cases.

Phenothiazine was supplied by the Connaught Laboratories and was refined and made into 0.5 gram tablets in the chemotherapy section of the Laboratories by Dr. Charles Siebenmann (22). Phenothiazine was supplied to physicians only. An instruction sheet was included with the drug covering in brief the life cycle of the parasite, mode of infection, method of diagnosis and directions for the use of phenothiazine.

Dosage of phenothiazine. Trials in 1940 started with dosages of 2.5 to 5 grams for children and 5 to 10 grams for adults, given over a period of 5 to 6 days. It soon became apparent that in some cases the dosage was inadequate. It was then increased to from 2.5 to 9 grams for children in proportion to age and 9 grams for adults, given over a period of 4 to 6 days; this is referred to as scale of dosage A (Table I). Toxic reactions were encountered with this scale of dosage, especially in small children, and it was reduced to the following levels, given over a period of 4 days, which is referred to as scale of dosage B:

Under 2 years of age, 0.25 grams daily, total 1 gram.
2 - 3 years of age, 0.5 grams daily, total 2 grams.
4 - 5 years of age, 0.75 grams daily, total 3 grams.
6 - 7 years of age, 1 gram daily, total 4 grams.
8 - 9 years of age, 1.25 grams daily, total 5 grams.
10 -11 years of age, 1.5 grams daily, total 6 grams.
12 - adults, 1.75 grams daily, total 7 grams.

For small children the tablets were crushed and mixed in food or orange juice. Others were advised to chew the tablets before swallowing. It was sug-

TABLE I
RESULTS OF TREATMENT OF 206 PATIENTS USING SCALE OF DOSAGE A

Ages in Years	Swabs Negative After First Course			Second Course Required			Third Course Required			Totals
	M.	F.	Total	M.	F.	Total	M.	F.	Total	
3 mos.–2	12	20	32		3	3	1	1	2	37
3–5	24	29	53	4	1	5				58
6–8	26	15	41		2	2				43
9–11	16	10	26		1	1				27
12–15	6	4	10		1	1				11
Total No. Children.....	84	78	162 (92%)	4	8	12 (6.8%)			2 (1.1%)	176
Adults.....	8	20	28 (93.3%)		2	2 (6.7%)				30

gested that extra fluid should be given during medication and constipation avoided, although instructions to take a laxative after every dose of phenothiazine were not given.

Results. The effectiveness of the treatment of the two groups of patients with different dosages of phenothiazine is shown in Tables I and II. Table I shows the results obtained in the treatment of 206 patients (176 children and 30 adults), using scale of dosage A.

Table I shows that the swabs of 162 or 92 per cent of the 176 children treated were negative after the first course of treatment; 12 children, or 6.8 per cent, required a second course of treatment, and 2 children were given a third course of treatment to render the swabs negative. The results from the treatment of 30 adults are similar to those obtained from the treatment of children in the same group.

The majority of the patients, 584 individuals, were treated with the reduced dosage, referred to as scale of dosage B. The results obtained are shown in Table II.

TABLE II

RESULTS OF TREATMENT OF 584 PATIENTS USING SCALE OF DOSAGE B

Ages in Years	Swabs Negative After First Course			Second Course Required			Third Course Required			Totals
	M.	F.	Total	M.	F.	Total	M.	F.	Total	
7 mos.–2	42	15	57	14	10	24	2	3	5	86
3–5	64	56	120	7	7	14				134
6–8	38	48	86	11	8	19				105
9–11	18	30	48	4	5	9				57
12–15	4	12	16	5	5	10				26
Total No. Children.....	166	161	327 (80.2%)	41	35	76 (18.6%)			5 (1.2%)	408
Adults.....	40	110	150 (85.2%)	5	15	20 (11.4%)	2	4	6 (3.4%)	176

Table II shows that of the 408 children treated, the swabs of 327, or 80.2 per cent, were negative after the first course of treatment; 76 children, or 18.6 per cent, required a second course, and 5 children required a third course of treatment to render the swabs negative. Of the 176 adults treated, the swabs of 150 individuals (85.2 per cent) were negative after the first course, 20 patients (11.4 per cent) required a second course and 6 patients were given a third course of treatment. It is apparent from the tables that scale of dosage A was more effective and a smaller percentage of patients required a second and third course of treatment than with the scale of dosage B.

TOXIC REACTIONS

Toxic reactions to phenothiazine, both in our series and those reported by other investigators, can be placed in the following categories: (a) anæmia, (b) skin reactions, (c) fever, (d) miscellaneous.

(a) *Anæmia.* The most commonly reported toxic reaction is reduction of hæmoglobin, in some cases so severe as to require emergency treatment.

Hæmoglobin determinations. Hæmoglobin determinations in connection with phenothiazine administration were previously carried out by Miller and Allen (7), and Bercovitz *et al* (8). Miller and Allen determined the hæmoglobin levels of 75 children, 4 to 12 years of age, before, during and after medication. The dosage of phenothiazine ranged from 6 to 8 grams given over a period of 6 to 8 days. They found that phenothiazine produced a definite, but in most cases slight, anaemia in at least half of the children treated; that the hæmoglobin reached its lowest level from 4 to 7 days after the completion of treatment and returned to normal level in 3 to 4 weeks. Bercovitz and his co-workers determined the hæmoglobin of 23 patients before, during and after phenothiazine therapy. Five patients showed no decrease of hæmoglobin, nine had a decrease of less than 10 per cent, and nine had a decrease of more than 10 per cent. The dosage of phenothiazine was 13 to 25 grams for children in proportion to age from 2 to 12 years, and 25 to 100 grams for adults; the drug was given over a period of 10 days.

In the present series, hæmoglobin determinations were made on 25 children on the medical wards of the Hospital for Sick Children and nine members of the staff of the School of Hygiene, who volunteered for this experiment. Scale of dosage B was used. The first determination was made immediately before the first dose of phenothiazine was given and a second determination was done on the fifth day after the administration of the last dose.

Dr. Charles Siebenmann, who determined the hæmoglobin levels, contributed the following note on the method used:

"For the determination of haemoglobin, 0.02 ml. of blood was added to 10 ml. of distilled water. After clearing this solution by addition of one drop of concentrated ammonia, its hæmoglobin content was determined with a Klett-Sunimerson photoelectric colorimeter, using the color filter No. 54. The method was standardized in co-operation with Dr. S. H. Jackson of the Hospital for Sick Children, by means of haemoglobin solutions of known concentration, as determined by the oxygen capacity method. The results are expressed as grams of hæmoglobin per 100 cc. of blood."

These determinations showed that 2 children out of 25 had a decrease of hæmoglobin of 3 grams, 4 children had a decrease of less than 2 grams, and 13 had a decrease of less than 1 gram. In 2 children the hæmoglobin level was not changed and the other 2 showed a slight increase of hæmoglobin after the treatment with phenothiazine.

Of the 9 adults, 2 showed a decrease of over 2 grams, 1 showed a decrease of between 1 and 2 grams, and 4 showed a decrease of less than one gram; in 2 individuals the hæmoglobin level was unchanged.

The case histories of those with more serious reactions in whom the dominant characteristic was anæmia, not included in the above group, are as follows:

Case 1. A girl, apparently in normal health, 18 months of age, weight 21 lbs., was treated for pinworms with one gram of phenothiazine daily for 4 days.

The foster mother reported that the child was constipated during the period of medication. Five days after treatment the child was taken to the hospital with severe anæmia. Her physician stated that the child was pale and irritable, and had enlarged and reddened tonsils; liver and spleen were not enlarged; Hb. 31 per cent Sahli (4.8 grams per cent); R.B.C. 2.0; W.B.C. 14.6. The child was transfused with whole blood and was discharged on the third day.

Case 2. A girl, 8 years of age, was given a total dosage of 5 grams of phenothiazine—1.25 grams daily for 4 days. The child, according to the mother, had been in poor health and had had a profuse vaginal discharge of several months' duration. Both the mother and the child were treated at the same time because both were infected with pinworms. The child was noted as being pale but no determination of the hæmoglobin level was made before treatment. One week after medication with phenothiazine the child was admitted to the hospital with vaginitis and anæmia; Hb. 49 per cent Sahli (7.6 grams per cent). R.B.C. 2.7. W.B.C. 7.2. Small transfusions of whole blood were given on 3 successive days. After 7 days her hæmoglobin was 82 per sent Sahli and the child was discharged from the hospital. About a month later her mother stated that the child was in good health and swabs taken on 14 consecutive days showed no ova.

Case 3. A girl, 2 years of age, was given a total dosage of 4 grams of phenothiazine over a period of 4 days. One week after the last dose the child was admitted to the hospital with anæmia and tonsillitis. She appeared tired and listless, and had a sore ear and throat; Hb. 69 per cent Sahli (10.8 grams per cent), R.B.C. 3.5; W.B.C. 12.8. Throat culture showed *Streptococcus viridans.* She was treated with sulfathiazole and transfused. On the fifth day she was discharged from the hospital in good general condition. Four months later the child was re-admitted to have her tonsils removed. No post-treatment swabs were obtained.

(b) *Skin Reactions.* In this series and in other published reports, the skin reactions have been neither serious nor common. The case histories of two patients are as follows:

Case 4. A girl, 2 years of age, was treated with a total dosage of 5 grams of phenothiazine over a period of 5 days. Her physician stated that the child was irritable during treatment. Ten days after treatment was completed a generalized rash appeared. There was a considerable pruritus wherever the rash was present and a slight œdema of the face, particularly about the eyes. The rash lasted about 10 days. Seven months later the child showed pinworm infection again and a total of 2.5 grams of phenothiazine were given over a period of 5 days. A similar but milder rash developed about 5 days after the treatment and lasted about 4 days. A skin-contact test with phenothiazine, performed by her physician, was negative.

Case 5. An adult female was given one dose of phenothiazine, 1.75 grams. She complained of stinging in ears and turned scarlet from chin to knees. About 36 hours later her hands became swollen. Treatment was discontinued.

Photosensitization. De Eds *et al* (9) reported that men who were spraying fruit trees with a suspension of phenothiazine complained of itching, irritation and reddening of the skin. Such reactions did not develop among the laboratory workers who continuously handled the drug. The authors suggested that the reaction was due to photosensitization produced by the derivatives of phenothiazine in the tissues and not due to a local action of phenothiazine.

No complaint of photosensitization has been received from any of the patients treated with phenothiazine during this investigation. One case, however, may be mentioned. To test if photosensitization did occur, an adult female, not under treatment for pinworms, was given 3 grams of phenothiazine experimentally in the morning and 6 hours later exposed to bright mid-day sun for 2 hours. Next morning her face and especially the sides of her neck were itchy and covered with a rash. There was no rash on the covered parts of the body. The subject had never experienced sensitiveness to plants, animals, food products or excessive sunshine. The rash persisted for 2 to 3 days and gradually disappeared. The experiment was not repeated, though it was believed that the skin reaction was due to photosensitization by phenothiazine, because no similar itching or rash was induced in the same individual by taking phenothiazine without prolonged exposure to bright sunshine.

(c) *Fever.* A rise in temperature during medication with phenothiazine has been recorded by other authors and the following cases were observed in this series:

Case 6. A girl, 6 years of age, developed a temperature of 100° F. after the first dose of one gram of phenothiazine. Treatment was discontinued.

Case 7. An adult female was given one dose, 1.75 grams, of phenothiazine. About 12 hours later she developed a temperature of 102° F. Treatment was discontinued.

(d) *Miscellaneous Reactions.*

Case 8. A girl, 13 years of age, complained of slight pain in the abdomen after the first dose of one gram of phenothiazine. Another gram was given next day, following which the pain became more severe. Treatment was discontinued.

Case 9. A boy, 11 years of age, was given 1.5 grams of phenothiazine on the day following appendectomy. The child complained of pain in the abdomen and treatment was discontinued.

There have been statements made by several mothers that their children lacked appetite and looked pale during treatment.

Phenothiazine Administered During Pregnancy and Nursing Period

No cases have previously been recorded of the administration of phenothaizine to human beings during pregnancy or the nursing period. However, Swales and Collier (10) found that the derivatives of phenothiazine were excreted in the milk of lactating ewes. Their experiments showed that the total amount of such derivatives was too small to have any toxic effect upon the lambs.

They also treated pregnant ewes with phenothiazine and in one case out of four, two lambs were still-born. The authors suggested that the laxative given with the drug may have accelerated the onset of parturition in that case, as blood obtained from one fœtus was found to be free of phenothiazine derivatives.

The present report gives the results of administration of phenothiazine to a nursing mother and 3 pregnant women. The scale of dosage B was used in all cases.

Case 10. A nursing mother, infected with pinworms, wished to be treated before leaving the hospital. Medication was started when her child was 5 days of age. The post-treatment swabs were negative after one course of treatment and her physician reported no untoward reaction in the mother or the child.

Case 11. A mother (pregnant for 3 months) was treated at the same time as her husband and 2 children. There were no ill effects and the post-treatment swabs were negative after one course of treatment.

Case 12. A young woman (pregnant for 5 months), her husband and sister were treated with phenothiazine. Two months later the treatment was repeated for all three, because swabs from the husband were positive after the first course. There were no untoward reactions and the second course of treatment was effective.

Case 13. A young woman, para. 1 (pregnant for 2 months), her husband and child were treated simultaneously. There were no ill effects and the post-treatment swabs were clear after one course of treatment.

Discussion

In the present series of observations, swabs were taken of 2,505 individuals; 1,214, or 48 per cent, were found to be infected with pinworms. This may not be the true incidence since in many instances the patients came to medical attention because of symptoms suggestive of pinworm infection, or because the presence of the parasite had already been demonstrated. The incidence, however, approximates closely the incidence obtained earlier in random surveys in the general population group and in hospital patients (11, 12, 13). The present series includes individuals from all social levels; some lived in crowded conditions with as many as 13 children in the family. Under such conditions, usually all members of the family were heavily infected. On the other hand, in the families having a higher income and in the professional classes, it was found that usually one or all of the children and the maid-servant, but not the parents, were infected.

Phenothiazine was administered to 1,275 patients. This number included 61 adults, mainly parents of infected children, who were given a full course of treatment although the infection was not demonstrated; these do not appear in the tables nor were any toxic reactions reported from them.

Dosage. There has been great variation in the scale of dosage of phenothiazine used by various investigators. Some authors have reported serious reactions and one fatal case occurred with the use of comparatively small dosage.

Table III summarizes the dosage of phenothiazine and the toxic reactions reported previously.

The table shows that the toxic reactions reported resulted from the use of dosages above the level of our scale of dosage B. On the other hand, large dosages have been used without ill effect.

In our series, case 1 is the only one in which a disturbing reaction occurred, the main feature being anæmia. The total dosage, 4 grams to a child of 18 months, is larger than scale A or B. With scale A the dosage would have been

TABLE III

DOSAGE OF PHENOTHIAZINE USED AND TOXIC REACTIONS PREVIOUSLY REPORTED

Author	Total No. of Cases Treated	Dosage in Grams	Cases showing Toxic Reactions		Remarks
			Age in Years	Type of Reaction	
Manson-Bahr (2)	21	7–40	–	–	Na_2SO_4 given with each dose
Elliott (14).....	26	24	–	–	Semi-solid diet; Na_2SO_4 before and after treatment
De Eds (15)....	19	19.9–28	3 adults	Hæmolytic anæmia	Phenothiazine used as urinary antiseptic
Lancet (16).....	1	8.5	6	Hæmolytic anæmia	Hb 23%; died after transfusion
Hubble (17)....	30	28 10.5 3	12 5 3	Jaundice, anæmia Slight anæmia Toxic hepatitis	Hb 60% Hb 72% Hb 75%
Most (18).....	47	21 32	6 adults	Hæmaturia Mild anæmia	Hb 12.6 gm.
Bercovitz (8) ...	68	6–100	–	–	Purified phenothiazine used
Johnstone (19)..	2	10 10	7 10	Jaundice, anæmia Mild anæmia	Hb 42%; temperature 102°F.; transfused
Grant (20).....	1	14	7	Anæmia	Hb 40%; transfused
Miller (7).....	75	6–8	–	–	Purified phenothiazine used
Sisk (21).....	168	20	14	Anæmia	Hb 30%; transfused
Kuitunen (1) ...	98	2.5–10	–	–	Purified phenothiazine used

2.5 grams; with scale B, 1 gram. It should be noted, however, that the child was constipated during medication, which may have resulted in accumulation of the drug or its derivatives in the body. It may be that Manson-Bahr (2) and Elliott (14) avoided toxic reactions with large dosages by giving their patients a laxative with the treatment. After the experience of case 1, it was added to the instructions that constipation was to be avoided during medication and a mild laxative given if necessary.

In cases 2 and 3 the reaction may have been related to the previous ill health of some duration. It would appear to have been wiser to postpone treatment until an effort had been made to improve the patient's general health. Where general

measures still leave the patient in a weakened state, as would be predicted in case 2—where the ill health appeared to be the result of extensive pinworm infection—the total dosage of the drug should be reduced to allow for this and the treatment repeated if necessary.

In case 9 the reaction of abdominal pain which followed the first dose may have been due to the disturbed metabolism of the immediate post-operative state. Phenothiazine should have been delayed until the conditions of the patient warranted its administration.

The remaining cases may have been sensitive to the drug, as individual variation in susceptibility to phenothiazine is known. It may be pointed out that in these cases no special investigation was carried out to determine whether the rise in temperature and other symptoms might have been due to other causes.

It would appear, however, that most of the severe reactions recorded are related to overdosage. It is therefore, advised that the dosage of phenothiazine should be kept at the level of our scale of dosage B in order to avoid untoward reactions, and the treatment be repeated if necessary.

Precautions. Phenothiazine in some instances has proved more toxic than gentian violet. However, the former appears to be more effective and it is apparently tolerated by a larger percentage of individuals than gentian violet. The period of treatment is shorter with phenothiazine, and it is easily administered to small children who are unable to swallow gentian violet tablets. The precautions to be observed are:

1. Highly purified phenothiazine should be used. It may be pointed out that most authors (Table III) have not specified whether they used purified or commercial phenothiazine, which may have an important bearing on the matter.
2. The patient should be in fair general health.
3. Constipation should be avoided during the treatment.
4. Treatment should be discontinued at once if there are signs of toxic reaction.
5. Pregnancy and lactation would seem to be no hindrance to treatment but until further evidence is available the closest supervision should be maintained.
6. Treatment should not be repeated sooner than 3 to 4 weeks after the first course.

Treatment of families. Swab examinations have shown that, in the majority of cases, if one member of the family is infected, all members of the household have the infection. It is, therefore, futile to treat one or some members and leave the others untreated to act as sources of reinfection. The following case may illustrate such a condition: A girl, 6 years of age, had been previously treated with various drugs, gentian violet included, but the infection persisted. Phenothiazine was then administered. The post-treatment swabs were negative but soon afterwards she showed the infection again. The other members of the family were then examined and only those whose swabs were positive were

treated. During the period of 2 years the child was treated by her physician periodically with a total of over 200 grams of phenothiazine but without permanent results. The family consisted of another child, a maid, and the parents. It is unlikely that the case was resistant to phenothiazine as well as to other drugs. This was probably one of the many instances encountered during these trials, in which some member of the family was a constant source of infection to the others.

It is frequently difficult to detect cases of slight infection even if more than 5 swabs are taken, whereas in cases of heavy infections all 5 swabs may show ova. The following case illustrates the difficulty in diagnosis of slight infection. A boy, 4 years of age, of a well-to-do-family, had been previously treated with gentian violet. His mother, however, stated that the child still had pinworms. Five swabs were taken but showed no ova. Ten additional swabs were taken and all were negative. There was no reason to believe that the swabs were not properly taken. Somewhat later the mother obtained and forwarded a parasite. The child was then treated with 2 courses of phenothiazine and was cleared clinically. There were apparently no other infected cases in the family.

This series also includes several cases in which the only child, 2 years of age or younger, was infected with pinworms and the mother either denied infection in herself or showed no symptoms indicative of infection. In those cases, however, when the mother was persuaded to be swabbed, she was usually found to be infected.

It is, therefore, advised that the whole family be examined by the NIH swab method if one member is known to be infected with pinworms; if for any reason examination is not possible, treatment should nevertheless be carried out on the whole family.

Summary

1. Phenothiazine was administered to 1,275 patients (900 children and 375 adults). Demonstration of the infection and the effectiveness of the treatment was carried out by the NIH swab method.

2. Blood hæmoglobin of 25 children and 9 adults was determined before and after administration of phenothiazine. Serious reduction in hæmoglobin was met in 2 children. Other toxic reactions encountered were skin reaction, fever and miscellaneous.

3. One nursing mother and 3 pregnant women were given phenothiazine without untoward reaction.

4. Two different scales of dosages were used. The smaller scale, up to 7 grams per person (in proportion to age) given over 4 days, is recommended.

Acknowledgments

The author is greatly indebted to Dr. Alan Brown, Physician-in-Chief, Dr. Nelles Silverthorne and other members of the staff in the Hospital for Sick Children, Toronto, for their kind interest and assistance in this work; to the physicians in private practice, those on the staff of the Women's College Hospital and

the Toronto General Hospital, and attending physicians in the Infants' Home and the Children's Aid Society of Toronto for their generous co-operation; to Dr. Donald Fraser, Professor of Hygiene and Preventive Medicine, who supervised the work; to Dr. C. O. Siebenmann, who purified the phenothiazine, and to the Connaught Laboratories for supplying it.

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Canadian Journal of Public Health

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THE THIRTY-FOURTH ANNUAL MEETING

THIS YEAR, for the first time since the outbreak of war, the Canadian Public Health Association is able to convene a full-scale meeting. The officers of the Association look forward to the coming session in Toronto, May 6th to 8th, as the initial effort in its expanded post-war program. The purpose of the annual meeting is to fulfill one of the prime functions of the Association, that of stimulating and disseminating public health thought and discussion amongst all health workers in Canada. The program committee has chosen speakers who will present interesting topical subjects which should stimulate discussion. In addition to members of the Association, several well-known authorities from the United States and Great Britain, as well as from other health fields in Canada, have been invited to discuss new health developments. Amongst the distinguished guests will be Sir Wilson Jameson, Chief Medical Officer, Ministry of Health, London; Professor Ira V. Hiscock, Yale University School of Public Health; Miss Alma C. Haupt, Director of Nursing Services, and Dr. George M. Wheatley, Assistant Medical Director, the Metropolitan Life Insurance Company, New York; and Dr. Halbert L. Dunn, Chief, Vital Statistics Division, Bureau of the Census, Washington.

The program will include such topics as the controversial problem of school health services, international health problems, future planning of public health nursing, anti-biotics, and the special Sectional subjects of sanitation, industrial hygiene, vital statistics, epidemiology, public health education, and public health nutrition.

The Ontario Health Officers Association and the Canadian Institute of Sanitary Inspectors (Ontario Branch) are holding their annual meetings in conjunction with the Canadian Public Health Association, and have planned several very interesting sessions which should be attractive to members of the Canadian Public Health Association as well.

A large attendance is expected and, as accommodation is limited, members are advised to make their plans now and write to the Association office for reservations.

Program

THIRTY-FOURTH ANNUAL MEETING

CANADIAN PUBLIC HEALTH ASSOCIATION

THIRTIETH ANNUAL MEETING

ONTARIO HEALTH OFFICERS ASSOCIATION

and

ANNUAL CONFERENCE

CANADIAN INSTITUTE OF SANITARY INSPECTORS

(*Ontario Branch*)

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ROYAL YORK HOTEL, TORONTO

MAY 6 - 8, 1946

A Message from the Honorary President of the Canadian Public Health Association

Photo by Karsh, Ottawa

The Canadian Public Health Association meets in 1946 for the first time after the combined effort of the Allied Nations has given us the opportunity to continue to work in peace for the improvement of the conditions of life of all our people. During the war we learned a good deal about working together. We also learned how much there was to do and how much could be done by collective effort in the fields of public health and preventive medicine.

In these fields great strides have been made since the turn of the century. Immunization has virtually wiped out smallpox and diphtheria. Pure water has virtually stopped typhoid. Mass medical, X-ray and dental examinations have resulted in the early discovery and treatment of disease and are powerful weapons in the hands of public health authorities in your fight for positive good health. We all know now what can be done given the will and the money to do it. Thoroughly informed and aroused public opinion is required to give you the support you need. In coördinating your work and developing this opinion, the Canadian Public Health Association is rendering invaluable service to all the people of Canada.

Minister of National Health and Welfare

GENERAL INFORMATION

Registration. All delegates are expected to register. A fee of **$1.00** is charged members and visitors to meet in part the expenses of the conference. Registration Desk: CONVENTION FOYER.

The scientific sessions, the luncheon meetings, and the dinner session will begin promptly at the hour indicated. Members can assist by planning their schedule in advance and by being on time. If you are planning to attend the dinner or the luncheons, **please buy your tickets well in advance.** The accommodation is limited.

The annual dinner of the three organizations will be held in the BALLROOM on Tuesday, May **7th**, at **6.30 p.m.** Tickets ($2.00) will be on sale at the Registration Desk. Early reservations will be desirable, as the accommodation is limited to 200.

A luncheon will be held in the TUDOR ROOM on Monday, May 6th, at **12.30 p.m.** The speaker will be DR. R. P. VIVIAN, Director of the Department of Health and Social Medicine, McGill University, Montreal, and formerly Minister of Health for the Province of Ontario. Tickets ($1.25) will be on sale at the Registration Desk from 8.30 a.m. Monday. The accommodation is limited to 150.

The Canadian Institute of Sanitary Inspectors will hold a luncheon in HALL A on Tuesday, May 7th, at **12.30 p.m.** Tickets ($1.25) will be on sale at the Registration Desk from 8.30 a.m. Monday. The accommodation is limited to 50.

Exhibits. The attention of members is directed to the exhibits of the following companies, which will be on view in the Convention Foyer:

Anglo-Canadian Drug Company Limited
Aerocide Dispensers Ltd.
The British Drug Houses (Canada) Ltd.
Burke Electric & X-Ray Corp. Ltd.
Burroughs Wellcome & Co.
Canadian Industries Limited
Canadian Kodak Company
Canadian Tampax Corporation
Central Scientific Company of Canada Ltd.
Ferranti Electric Limited
Charles E. Frosst & Co.
The J. F. Hartz Co. Limited
Ingram & Bell Limited
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The Macmillan Co. of Canada Ltd.
Reckitt & Colman (Canada) Ltd.
The Ryerson Press
Frederick Stearns & Company of Canada Ltd.
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Victor X-Ray Corporation of Canada, Ltd.
A. Wander Limited
William R. Warner & Company, Ltd.
G. H. Wood & Company Limited
John Wyeth & Brother (Canada) Limited
X-Ray & Radium Industries Ltd.

Hotel Reservations. Only a limited number of rooms are available at the Royal York Hotel for members attending this meeting. Requests for reservations at this hotel should **not** be addressed to the Royal York, but to the Canadian Public Health Association, 150 College Street, Toronto 5. Only double rooms are available. For the convenience of members in requesting reservations, a form is provided on page 43 of this issue.

Reservations for hotels other than the Royal York should be forwarded direct to the hotel concerned.

DIRECTORY OF SESSIONS

Monday, May 6

8.30 a.m.—Registration. Fee $1.00, for members and visitors. CONVENTION FOYER.

9.30 a.m.—Canadian Public Health Association. Section Meetings: Epidemiology and Vital Statistics. HALL A. Public Health Nursing. LIBRARY.

Ontario Health Officers Association. BALLROOM.

Canadian Institute of Sanitary Inspectors. HALL B.

12.30 p.m.—Canadian Public Health Association, Ontario Health Officers Association, Canadian Institute of Sanitary Inspectors. Luncheon. TUDOR ROOM. Tickets, $1.25.

2.00 p.m.—Canadian Public Health Association and Ontario Health Officers Association. General Session. BALLROOM.

Canadian Institute of Sanitary Inspectors. HALL B.

8.15 p.m.—Canadian Public Health Association, Ontario Health Officers Association, Canadian Institute of Sanitary Inspectors. Program of Films. BALLROOM.

Canadian Public Health Association. Meeting of Executive Council. LIBRARY.

Ontario Health Officers Association. Meeting of Executive Committee. PRIVATE DINING ROOM No. 6.

Tuesday, May 7

9.00 a.m.—Canadian Public Health Association. Section Meetings: Epidemiology. PRIVATE DINING ROOM No. 7. Nutrition. PRIVATE DINING ROOM No. 3. Vital Statistics. LIBRARY.

Ontario Health Officers Association. CONCERT HALL.

Canadian Institute of Sanitary Inspectors. HALL B.

12.30 p.m.—Canadian Institute of Sanitary Inspectors. LUNCHEON. HALL A. Tickets, $1.25.

2.00 p.m.—Canadian Public Health Association, Ontario Health Officers Association, Canadian Institute of Sanitary Inspectors. General Session. CONCERT HALL.

6.30 p.m.—Canadian Public Health Association, Ontario Health Officers Association. Dinner. BALLROOM. Tickets, $2.00.

Wednesday, May 8

9.00 a.m.—Canadian Public Health Association. Section Meetings: Industrial Hygiene. PRIVATE DINING ROOMS Nos. 1-3. Public Health Education. PRIVATE DINING ROOM No. 8. Public Health Nursing. LIBRARY.

Ontario Health Officers Association and Canadian Institute of Sanitary Inspectors. Joint Session. CONCERT HALL.

2.00 p.m.—Canadian Public Health Association and Ontario Health Officers Association. General Session. BANQUET HALL.

Canadian Institute of Sanitary Inspectors (Dominion Branch). HALL B.

Program

THE OUTLINE PRESENTED IN THE FOLLOWING PAGES IS NECESSARILY INCOMPLETE AND SUBJECT TO CHANGE, BUT IT OFFERS A PREVIEW OF THE SESSIONS PLANNED FOR THIS YEAR'S MEETING.

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Monday, May 6 - 9.30 a.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
Sections of Epidemiology and Vital Statistics

HALL A

Chairman: DR. G. M. LITTLE, Medical Officer of Health, Edmonton, Alberta, and Chairman of the Section of Epidemiology.

Title to be announced.
H. LUKIN ROBINSON, Vital Statistics Branch, Dominion Bureau of Statistics, Ottawa.

Social Areas at the Service of Public Health
DR. ANT. B. VALOIS, Demographer and Superintendent of the Division of Vital Statistics, Department of Health of Montreal.

An Outbreak of Typhoid Fever traced to a Wedding Breakfast
J. M. DESRANLEAU, B.A., L.Sc., Assistant Bacteriologist, Division of Laboratories, Ministry of Health and Social Welfare of the Province of Quebec, Montreal.

Diphtheria Studies in Nova Scotia
Members of the Department of Public Health of Nova Scotia.

Monday, May 6 - 9.30 a.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
Public Health Nursing Section

LIBRARY

Chairman: MISS HELEN G. MCARTHUR, M.Sc., Superintendent of Public Health Nurses, Department of Public Health, Province of Alberta, Edmonton, and Chairman of the Section.

Growth in Public Health Nursing Services
MISS DOROTHY E. TATE, Director of Public Health Nursing, Provincial Board of Health of British Columbia, Victoria.

Preparation of the Public Health Nurse for Service in Rural Health Units
MISS ELIZABETH RUSSELL, Director of Public Health Nurses, Department of Health and Public Welfare of Manitoba, Winnipeg.

Public Health Nursing in the County Health Units
MISS M. V. LAROSE, Director of Public Health Nursing, Ministry of Health and Social Welfare of the Province of Quebec, Montreal.

Monday, May 6 - 9.30 a.m.

ONTARIO HEALTH OFFICERS ASSOCIATION

BALLROOM

Chairman: DR. J. W. MACKIE, Medical Officer of Health, Lansdowne, and President of the Association.

Presidential Address
DR. MACKIE.

Message of Welcome
THE HON. RUSSELL T. KELLEY, Minister of Health of Ontario and Honorary President of the Ontario Health Officers Association.

Open Discussion of Current Problems

Monday, May 6 - 9.30 a.m.

CANADIAN INSTITUTE OF SANITARY INSPECTORS
(Ontario Branch)

HALL B

Chairman: R. W. RUGGLES, C.S.I.(C.), President.

Welcome to Members

Taking Stock of Ourselves
A. S. O'HARA, R.S.I., C.S.I.(C.), Provincial Sanitary Inspector, Kenora.

Discussion

Monday, May 6 - 12.30 p.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
ONTARIO HEALTH OFFICERS ASSOCIATION
CANADIAN INSTITUTE OF SANITARY INSPECTORS

LUNCHEON — TUDOR ROOM

Chairman: DR. J. W. MACKIE, Medical Officer of Health, Lansdowne, Ontario, and President of the Ontario Health Officers Association.

Address: Health and Social Medicine
DR. R. P. VIVIAN, Director, Department of Health and Social Medicine, McGill University.

Tickets ($1.25) will be on sale from 8.30 a.m. Early reservations are desirable, as the accommodation is limited to 150.

Monday, May 6 - 2.00 p.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
and
ONTARIO HEALTH OFFICERS ASSOCIATION

GENERAL SESSION — BALLROOM

Chairman: DR. J. W. MACKIE, Medical Officer of Health, Lansdowne, and President of the Ontario Health Officers Association.

Presidential Address
DR. C. W. MACMILLAN, Associate Director, Department of Health and Social Medicine, McGill University, and President of the Canadian Public Health Association.

Future Goals in Public Health Nursing
MISS ALMA C. HAUPT, Director, Nursing Bureau, The Metropolitan Life Insurance Company, New York.

The International Statistical Needs of Public Health
DR. HALBERT L. DUNN, Chief, Vital Statistics Division, Bureau of the Census, Washington, D.C., and Secretary General, Inter American Statistical Institute.

Title to be announced
DR. IRA V. HISCOCK, Professor of Public Health, Yale University School of Medicine, New Haven.

Monday, May 6 - 2.00 p.m.

CANADIAN INSTITUTE OF SANITARY INSPECTORS

HALL B

Chairman: R. W. RUGGLES, C.S.I.(C.), President.

Psittacine Birds: Their Origin, Common Diseases, Regulations, and Display of Birds
T. H. JACKSON, C.S.I.(C.), Chief Quarantine Officer, Department of Public Health, Toronto.

Houses to Rent for Low-income Groups
F. C. AUSTIN, Chief Inspector, Division of Sanitation and Housing, Health Department, Winnipeg.

Monday, May 6 - 8.15 p.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
ONTARIO HEALTH OFFICERS ASSOCIATION
CANADIAN INSTITUTE OF SANITARY INSPECTORS

PROGRAM OF FILMS — BANQUET HALL

Monday, May 6 - 8.15 p.m.

CANADIAN PUBLIC HEALTH ASSOCIATION

MEETING OF EXECUTIVE COUNCIL — LIBRARY

Presiding: DR. C. W. MACMILLAN.

Monday, May 6 - 8.15 p.m.

ONTARIO HEALTH OFFICERS ASSOCIATION

MEETING OF EXECUTIVE COMMITTEE
PRIVATE DINING ROOM No. 6

Presiding: DR. J. W. MACKIE.

Tuesday, May 7 - 9.00 a.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
Section of Epidemiology

PRIVATE DINING ROOM No. 7

Chairman: DR. G. M. LITTLE, Medical Officer of Health, Edmonton, Alberta.

Treatment of Personnel of the Merchant Marine during the War
DR. C. P. BROWN, Chief, Division of Quarantine, Immigration and Sick Mariners Medical Service, Department of National Health and Welfare, Ottawa.

The Tuberculosis Control Program in Halifax
DR. C. J. W. BECKWITH, Medical Superintendent, Halifax Tuberculosis Hospital, and Director of Tuberculosis Control for the City of Halifax.

Communicable Disease in Saskatchewan
DR. H. S. DOYLE, Director, Division of Communicable Diseases, Department of Public Health of Saskatchewan, Regina.

A Three-Year Experiment with Combined Diphtheria Toxoid — Pertussis Vaccine
DR. A. R. FOLEY, Epidemiologist, Ministry of Health and Social Welfare of the Province of Quebec, Quebec.

The Experience with Diphtheria and Tetanus Immunization in the R.C.A.F.
DR. J. M. MATHER, St. Catharines — Lincoln Health Unit, Beamsville, Ontario, and DR. W. B. MCCLURE, Division of Laboratories, Department of Health of Ontario, Toronto.

Tuesday, May 7 - 9.00 a.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
Nutrition Section

PRIVATE DINING ROOM No. 3

Presiding: DR. E. W. MCHENRY, Professor of Public Health Nutrition, School of Hygiene, University of Toronto.

Nutrition Problems of Pre-school Children
DR. H. J. LEESON, Department of Public Health Nutrition, School of Hygiene, University of Toronto.

Nutrition and School Children
DR. J. ERNEST SYLVESTRE, Ministry of Health and Social Welfare of the Province of Quebec.

A Nutrition Survey in Marysville, New Brunswick
DR. JEAN WEBB, Nutritionist, Department of Health of New Brunswick, Fredericton.

The Rural School Lunch Program
MISS MARGARET E. NIX and MRS. MARGARET VANN, Department of Health and Public Welfare of Manitoba, Winnipeg.

Formation of Section and election of Officers for 1946-47.

Tuesday, May 7 - 9.00 a.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
Vital Statistics Section

LIBRARY

Chairman: DR. PAUL PARROT, Demographer, Ministry of Health and Social Welfare of the Province of Quebec.

Presentation and Discussion of Reports

Revision of International List of Causes of Death
DR. J. WYLLIE, Professor of Preventive Medicine, Queen's University.

Report of the Committee on Annual Reports
Mr. J. D. B. SCOTT, Registrar of Births, Deaths and Marriages, Provincial Board of Health of British Columbia, Victoria.

Report of the Committee on Stillbirths
DR. ERNEST COUTURE, Director, Division of Maternal and Child Health, Department of National Health and Welfare, Ottawa.

Election of Officers for 1947.

Tuesday, May 7 - 9.00 a.m.

ONTARIO HEALTH OFFICERS ASSOCIATION
CONCERT HALL

Chairman: DR. J. W. MACKIE, Medical Officer of Health, Lansdowne, and President of the Association.

Public Health — Present, Past and Future
DR. H. L. LOGAN, Sussex District Medical Health Officer, Sussex, N.B.

Education as an Aid to the Extension of Health Services
MISS MARGARET E. NIX, Director, Bureau of Health Education, Department of Health and Public Welfare of Manitoba, Winnipeg.

A Review of Immunization Procedures
DR. F. O. WISHART, Associate Professor of Hygiene and Preventive Medicine, University of Toronto.

Antibiotics
DR. R. F. FARQUHARSON, Assistant Professor of Therapeutics and Head of the Department, and Assistant Professor of Medicine, University of Toronto.

Tuesday, May 7 - 9.00 a.m.

CANADIAN INSTITUTE OF SANITARY INSPECTORS
HALL B

Chairman: R. W. RUGGLES, C.S.I.(C.), President, Ontario Branch.

Annual Meeting and Election of Officers, Ontario Branch

Tuesday, May 7 - 12.30 p.m.

CANADIAN INSTITUTE OF SANITARY INSPECTORS

LUNCHEON — HALL A

(Tickets, $1.25)

Tuesday, May 7 - 2.00 p.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
ONTARIO HEALTH OFFICERS ASSOCIATION
CANADIAN INSTITUTE OF SANITARY INSPECTORS

SPECIAL SESSION — CONCERT HALL

Chairman: DR. C. W. MACMILLAN.

Speakers:
SIR WILSON JAMESON, Chief Medical Officer, Ministry of Health, London.
DR. JAMES A. DOULL, Chief, Office of International Health Relations, United States Public Health Service, Washington.
THE HON. BROOKE CLAXTON, Minister of National Health and Welfare, Ottawa.

Tuesday, May 7 - 6.30 p.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
ONTARIO HEALTH OFFICERS ASSOCIATION
CANADIAN INSTITUTE OF SANITARY INSPECTORS

DINNER — BALLROOM

Chairman: DR. C. W. MACMILLAN.

Addresses
SIR WILSON JAMESON, Chief Medical Officer, Ministry of Health, London.
DR. JAMES A. DOULL, Chief, Office of International Health Relations, United States Public Health Service, Washington.
THE HON. BROOKE CLAXTON, Minister of National Health and Welfare, Ottawa.
THE HON. RUSSELL T. KELLEY, Minister of Health of the Province of Ontario.
Presentations of honorary life membership in the Canadian Public Health Association.

Tickets ($2.00) will be on sale at the Registration Desk from 8.30 a.m. Monday. Early reservations are desirable, as the accommodation is limited to 200.

Wednesday, May 8 - 9.00 a.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
Industrial Hygiene Section

PRIVATE DINING ROOMS Nos. 1-3

Chairman: DR. F. J. TOURANGEAU, Director, Division of Industrial Hygiene, Ministry of Health and Social Welfare of the Province of Quebec, Montreal.

An Industrial Hygiene Program in an Agricultural Province
DR. HUGH MALCOLMSON, Department of Health and Public Welfare of Manitoba, Winnipeg.

Supervision of Health in Small Plants
DR. F. M. JONES, Medical Officer, Canadian Industries Limited, Montreal.

The Patch Test in Occupational Skin Diseases
DR. WILLIAM GARBE, Dermatologist, Toronto.

Clinical Study of Neurotic Disorders in the Plant
DR. J. ALLEN WALTERS, Toronto.

Election of Officers for 1947.

Wednesday, May 8 - 9.00 a.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
Public Health Education Section

PRIVATE DINING ROOM No. 8

Chairman: DR. STEWART MURRAY, Senior Medical Health Officer, Metropolitan Health Committee, Vancouver.

Program to be announced.

Wednesday, May 8 - 9.00 a.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
Public Health Nursing Section

LIBRARY

Chairman: MISS HELEN G. MCARTHUR, M.Sc., Superintendent of Public Health Nurses, Department of Public Health, Province of Alberta, Edmonton.

Working Relationships between Hospitals and Community Health Agencies
MISS ELSIE HICKEY, Director, Division of Public Health Nursing, Department of Public Health, City of Toronto.

Report of the Study Committee
MISS ISOBEL BLACK, Director of Nursing, The University of Manitoba, Winnipeg.

Nursing Developments in United States
MISS ALMA C. HAUPT, Director, Nursing Bureau, The Metropolitan Life Insurance Company, New York.

Election of Officers for 1947.

Wednesday, May 8 - 9.00 a.m.

ONTARIO HEALTH OFFICERS ASSOCIATION
CANADIAN INSTITUTE OF SANITARY INSPECTORS

JOINT SESSION — CONCERT HALL

Presiding: D. S. MCKEE, C.S.I.(C.), President of the Canadian Institute of Sanitary Inspectors and Chief Sanitary Inspector, Department of Health of Ontario.

Food Sanitation and Restaurant Inspection (illustrated with sound filmstrips)
A. R. B. RICHMOND, V.S., B.V.Sc., Director, Division of Food Control, Department of Public Health, Toronto.

The Public Health Application of the Insecticide D.D.T.
DR. J. H. BAILLIE, Executive Director, Canadian Public Health Association, Toronto.

Bacteriological Dirt and Dishwashing Practices
MORLEY C. JAMIESON, B.S.A., M.Sc., Professor of Bacteriology, The University of Manitoba, Winnipeg.

Wednesday, May 8 - 2.00 p.m.

CANADIAN PUBLIC HEALTH ASSOCIATION
ONTARIO HEALTH OFFICERS ASSOCIATION

GENERAL SESSION — BANQUET HALL

Presiding: DR. C. W. MACMILLAN.

The School Health Survey being Conducted by The Canada and Newfoundland Education Association in co-operation with the Canadian Public Health Association
DR. A. J. PHILLIPS, Chairman, School Health Survey Committee, The Canada and Newfoundland Education Association, Toronto.

Panel Discussion: School Health Services

Chairman: DR. G. F. AMYOT, Provincial Health Officer, Provincial Board of Health, Victoria, B.C.

Participants:
DR. GEORGE M. WHEATLEY, Assistant Vice-President, Health and Welfare Division, The Metropolitan Life Insurance Company, New York.
DR. I. M. CLEGHORN, Medical Officer, St. James—St. Vital Health Unit, Manitoba.
DR. JULES GILBERT, Director of Health Education, Ministry of Health and Social Welfare of the Province of Quebec, Quebec.
DR. J. M. HERSHEY, Assistant Provincial Health Officer, Provincial Board of Health of British Columbia, Victoria.
DR. H. L. LOGAN, District Medical Health Officer, Sussex, N.B.
DR. C. E. PHILLIPS, Secretary, The Canada and Newfoundland Education Association, Toronto.
MR. C. B. ROUTLEY, Assistant Superintendent of Elementary Education, Department of Education of Ontario, Toronto.
MISS ELIZABETH SMITH, Director, Division of Public Health Nursing, Department of Public Health of Saskatchewan, Regina.

Wednesday, May 8 - 2.00 p.m.

CANADIAN INSTITUTE OF SANITARY INSPECTORS
(Dominion Branch)

Presiding: D. S. MCKEE, C.S.I.(C.).

Annual Meeting and Election of Officers, Dominion Branch